Topic: Limits of combinations

Question: Use the given functions to evaluate the limit.

$$\lim_{x \to 2} f(x) - g(x)$$

when $f(x) = x - 5$ and $g(x) = 3$

Answer choices:

A $\lim_{x \to 2} f(x) - g(x) = 6$

B $\lim_{x \to 2} f(x) - g(x) = -6$

C $\lim_{x \to 2} f(x) - g(x) = 0$

D $\lim_{x \to 2} f(x) - g(x) = \infty$

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Solution: B

To solve a limit the involves the combination of two functions, find the limits of the two functions separately and then perform the combination operation on the results of the limits.

First, we'll separate the limit into two limits.

$$\lim_{x\to 2} f(x) - g(x)$$

$$\lim_{x\to 2} f(x) - \lim_{x\to 2} g(x)$$

Now we'll use the given functions to make substitutions.

$$\lim_{x\to 2}(x-5) - \lim_{x\to 2}(3)$$

Evaluate the limits.

$$(2-5) - (3)$$

$$-3 - 3$$

$$-6$$

This is the value of the limit.

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Topic: Limits of combinations

Question: Use the given functions to evaluate the limit.

$$\lim_{x \to 3} 2f(x)g(x)$$

when $f(x) = x^3$ and $g(x) = 2 - x^2$

Answer choices:

A $\lim_{x \to 3} 2f(x)g(x) = 189$

B $\lim_{x \to 3} 2f(x)g(x) = -189$

C $\lim_{x \to 3} 2f(x)g(x) = 378$

D $\lim_{x \to 3} 2f(x)g(x) = -378$

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Solution: D

To solve a limit the involves the combination of two functions, find the limits of the two functions separately and then perform the combination operation on the results of the limits.

First, we'll separate the limit into two limits.

$$\lim_{x\to 3} 2f(x)g(x)$$

$$\lim_{x\to 3} 2f(x) \lim_{x\to 3} g(x)$$

$$2\lim_{x\to 3} f(x) \lim_{x\to 3} g(x)$$

Now we'll use the given functions to make substitutions.

$$2\lim_{x\to 3}\left(x^3\right) \lim_{x\to 3}\left(2-x^2\right)$$

Evaluate the limits.

$$2\left(3^3\right)\left(2-3^2\right)$$

$$2(27)(-7)$$

$$-378$$

This is the value of the limit.

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Topic: Limits of combinations

Question: Use the given functions to evaluate the limit.

$$\lim_{x \to -1} \frac{f(x)}{4g(x)}$$

when $f(x) = \dfrac{x^2 + 2x + 1}{x + 1}$ and $g(x) = x - 1$

Answer choices:

A $\lim_{x \to -1} \dfrac{f(x)}{4g(x)} = -\infty$

B $\lim_{x \to -1} \dfrac{f(x)}{4g(x)} = \infty$

C $\lim_{x \to -1} \dfrac{f(x)}{4g(x)} = 0$

D The limit does not exist (DNE)

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Solution: C

To solve a limit the involves the combination of two functions, find the limits of the two functions separately and then perform the combination operation on the results of the limits.

First, we'll separate the limit into two limits.

$$\lim_{x\to -1} \frac{f(x)}{4g(x)}$$

$$\frac{\lim_{x\to -1} f(x)}{\lim_{x\to -1} 4g(x)}$$

$$\frac{\lim_{x\to -1} f(x)}{4\lim_{x\to -1} g(x)}$$

Now we'll use the given functions to make substitutions.

$$\frac{\lim_{x\to -1} \left(\frac{x^2+2x+1}{x+1}\right)}{4\lim_{x\to -1}(x-1)}$$

$$\frac{\lim_{x\to -1} \frac{(x+1)(x+1)}{x+1}}{4\lim_{x\to -1} x-1}$$

$$\frac{\lim_{x\to -1} x+1}{4\lim_{x\to -1} x-1}$$

Evaluate the limits.

$$\frac{-1+1}{4(-1-1)}$$

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$$\frac{0}{-8}$$

$$0$$

This is the value of the limit.

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